DIFFERENTIAL WINTER MORTALITY BETWEEN MALE AND FEMALE MULE DEER FAWNS IN UTAH

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Abstract.— During the winters of 1980–1984 winter mortality of mule deer fawns in central Utah was assessed. It was determined that the winter mortality ratio for female fawns as compared to males was 156:100. This mortality factor should be taken into consideration by game and range managers when determining harvest recommendations.

Among black-tailed deer (*Odocoileus hemionus columbianus*) under 18 months of age in California more males died than females during winter (Taber and Dasmann 1954). Higher male winter mortality rates documented in the California study conflict with casual observations made by the author during early spring winter–range evaluations in Utah. These impressions indicated exactly the opposite: many more female than male fawns died during winter. Such observations incur greater significance when one considers that males generally predominate in fetal sex ratios (Anderson 1981). If winter mortality among fawns had been random, one would expect to observe more dead male than female fawns. Therefore, this study was initiated to investigate the possible existence of differential winter mortality between mule deer male and female fawns.

Study Area and Methods

The vegetative communities on the study sites were composed of Gambel oak (*Quercus gambelii*), pinyon pine (*Pinus edulis*), Utah juniper (*Juniperus osteosperma*), and big sagebrush (*Artemisia tridentata*) in varying percentages and combinations. Elevation of winter ranges varied from 1500 m to 2300 m. The counties studied were Juab, Salt Lake, Sanpete, Tooele, Utah, and Wasatch. Selected winter ranges in these counties were chosen because of high concentrations of wintering mule deer and past histories of winter losses during winters with higher than average snow fall and subzero temperatures.

Historical data concerning sex ratio of fawns in the study area were taken from Utah Division of Wildlife Resources records on file at the Central Regional Office, Springville, and from a search of the literature. Zwank (1979) completed a study of fawn mortality within the study area and captured 29 male and 22 female fawns (132:100). Additional live-trapping data during the winter on the study area yielded 196 male fawns and 155 females, a sex ratio of 126 male to 100 female fawns (Utah Division of Wildlife Resources records on file in Central Regional Office, Springville). Others working with mule deer fawns in the west show even higher male:female ratios in fetal and neonatal studies (Warren 1973, Papez 1976, Robinette et al. 1957a, 1977, Zeigler 1978, Anderson 1981, Smith 1983). These reported ratios ranged from 101:100 to 172:100 ($N = 4471$, $\bar{X} = 113:100$). I used the ratio of 111:100 (Robinette et al. 1957a) in the chi-square statistical analysis. This ratio was used because it represents an average ratio over a number of studies, and this conservative ratio is lower for males than was actually observed in the study area.

Deer winter range in central Utah was searched via horseback during spring 1980 through 1984 in an effort to determine the extent of winter loss of mule deer fawns. Wintering areas were systematically searched at the same intensity (260 km per year) and on predetermined lines of travel each spring. Winter-killed deer were sexed using the presence of antler pedicels to denote male fawns and aged according to the technique de-

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scribed by Robinette et al. (1957b). Records were kept by date, herd unit, sex, age, and drainage. Differential winter mortality of female fawns was tested statistically by chi-square analysis (Huntsberger 1967).

RESULTS

Mule deer fawn winter loss observed in central Utah, 1980–1984, shows 587 males and 913 females (Table 1). The mean ratio of dead males to females was 100:156 for the study period. The observed winter losses for 1980, 1982, 1983, and 1984, where sample sizes were >200 each year, yielded ratios of 100:159, 100:152, 100:158, and 100:154, respectively.

Chi-square analysis showed that winter mortality of female fawns observed in central Utah was significantly higher ($X^2 = 57.65$, 4df, $P<0.005$) than would be expected from random selection assuming a male to female ratio of 111:100 at birth and equal summer-fall mortality rates (Table 1). The death ratio of male to female fawns showed a range of 100:200–100:152. The five-year mean was 100:156 males to females.

DISCUSSION

Results indicate higher differential winter mortality occurs among female fawns in central Utah. These results differ greatly from the higher male fawn mortality rates reported by Taber and Dasmann (1954) but agree more closely with the 0.94:1.00 male to female ratio found in Utah by Robinette et al. (1957a). He stated, "The winter-loss rate for female fawns is about 1.2 times that of males."

One possible explanation for the observed differential winter mortality among females and males is that fawn weights recorded in October have shown female fawns to be from 9 to 13% lighter than males (Brown 1961, Austin and Urness 1976, Robinette et al. 1977, Papez 1976, Pederson 1970). During extreme winters, such as those experienced in 1980, 1982, 1983, and 1984, a 9–13% lower body weight for female fawns may be enough of a factor to result in higher winter mortality for females than for males. A realistic maximum allowable weight loss for wild deer is from 20 to 25% of their fall body weight (Brown 1961).

Time of breeding may affect the sex ratio of fawns (Ozoga and Verme 1975). White-tailed deer (*O. virginianus*) females bred early (13–24 hours) in their estrus cycle gave birth to 14.3% male fawns. The percent of male fawns increased up to 80.8 for does bred 49–95 hours after the onset of estrus (Verme and Ozoga 1981). At the start of the breeding season, bucks have more does to service than at the end of the season. Central Utah herds typically have a low buck to doe ratio due to extremely high "buck only" hunting pressure (Jense 1982). For the first estrus cycle of the year, perhaps a higher number of does are bred late in estrus, which results in more male fawns. These would be at least 28 days older than fawns born to does bred in a later estrus cycle; similarly, early-conceived fawns (predominantly female) could be even older. Breeding in the second or third estrus not only results in fawns 28–56 days younger but, because the limited number of bucks have fewer does to service, these offspring may be largely female. Late season (November–December) buck hunts in Utah

TABLE 1. Mule deer fawn winter loss observed in Central Utah, 1980–1983.

Year	Dead male fawns	Dead female fawns	Total dead fawns	Expected number of dead female fawns[1]	Ratio F/M
1980	86	137	223	106	1.59
1981	3	6	9	4	2.00
1982	164	250	414	196	1.52
1983	146	231	377	179	1.58
1984	188	289	477	226	
Total (mean)	587	913	1500	711	(1.56)*

[1]Expected number of dead female fawns is calculated by multiplying .474 by the total number of dead fawns. The coefficient .474 is based on the ratio of 111 male fawns to 100 female fawns.
*($P<0.005$)

may have contributed to disruption of breeding cycles and imbalanced sex ratios in breeding herds. This has profound management implications and should be investigated further. Heavy buck harvest may indirectly be influencing neonatal sex ratios, thus lowering potential winter survival of both sexes of fawns. A large part of the annual fawn crop being born late in the season could result in smaller fawns (of both sexes) entering the winter period. But this may have a greater affect on the female segment of the herd.

The occurrence of differential mortality rates of female fawns is of particular interest because the reproductive segment of the herd is being adversely affected. When such losses occur they must be taken into account by those responsible for drafting management plans and making harvest recommendations. The loss of high numbers of female fawns several years in succession could severely reduce the potential rate of herd increase. A knowledge of the extent of female losses should help managers reduce controllable mortality such as legal harvest.

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